GALWAY LAKE
INTEGRATED LAKE MANAGEMENT PLAN

PREPARED BY THE
LAKE PRESERVATION COMMITTEE STEERING GROUP
GALWAY LAKE CAMPERS ASSOCIATION, INC.
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Introduction

Over the past several years the Galway Lake Campers Association has devoted an increasing amount of effort and resources to the activities required to maintain the esthetic and recreational quality of Galway Lake. This plan will assist in the management of these activities by providing a blueprint for the variety of actions required to identify, monitor and mitigate factors that threaten the lake.

General

During the past 20 years the Darin Fresh Water Institute and Dr Bruce Rowell have conducted 4 professional studies involving the ecology of Galway Lake. During the same period, the lake has been monitored through the New York State Citizens Lake Assessment Program (CSLAP), which provides yearly assessments of factors that impact the health and recreational quality of lakes in New York State.

Findings from CSLAP and the four ecology studies have generally concluded that Galway Lake has been, and continues to be, a healthy recreational lake. However, like most recreational lakes, Galway has issues with invasive weeds, algae, aggressive weed growth, sedimentation and bacteria.

This plan will address each significant lake issue in terms of known causes and actions taken or planned to remedy the cause or reduce its impact. The plan will be updated as required to address the current status of historical issues as well as new issues or problems noted.

Characteristics of a Recreational Lake

Individual perceptions relating to the characteristics of a good recreational lake will vary widely. Therefore, this management plan will key on lake quality objectives identified in the New York State Department of Environmental Conservation (NYSDEC) classification standards for Galway Lake.

NYSDEC has classified Galway Lake as a Class B lake in a Mesotrophic ecological setting. Class B lakes are lakes that meet standards for bacteria and are suitable for swimming and fishing. Mesotrophic lakes are lakes populated with native weeds with minimum and maximum standards for water clarity, nutrients and algal growth.

Issues Impacting the Esthetic and Recreational Quality of Galway Lake

As previously discussed, the primary issues impacting the esthetic and recreational quality of the lake are; **invasive species; aggressive weed growth; algae; sedimentation and bacteria.**

Mitigation activities for each issue should be primarily directed toward the cause and long-term management. However when these measures are deemed not effective in the short-term, more direct, alternative actions may be required.

Nutrients

Lake studies have concluded that excessive nutrients are the primary cause of the aggressive weed growth and algae issues in Galway Lake. Therefore, the long-term mitigation of these issues must be tied to a substantive reduction in the level of nutrients entering lake water from both external and internal sources.

External Sources

External nutrient sources include:

- Failing or inefficient Onsite Wastewater Treatment Systems (OWTS),
- Farm and agriculture activity,
- Beaver and development activity in the watershed,
- Fertilizer and;
- Waterfowl.

Onsite Wastewater Treatment Systems (OWTS)

Problem

Failing and inefficient camper septic systems have long been recognized as a primary source of lake nutrients. Many camper septic systems are not in compliance with current OWTS standards and are leaching nutrients and noxious bacteria into the lake via surface and ground water. Attempts to deal with this problem in the past were frustrated by: an ineffective town ordinance; inconsistent Code Enforcement Official support and a lack of camper initiative in addressing OWTS issues.

Actions Taken

Campers have been encouraged to properly maintain their septic systems and for the past several years the Association has made arrangements to provide campers a reduced rate for septic pumping services.

The Association worked with Galway officials to bring the OWTS provisions of the town ordinance in compliance with state guidance related to the design, installation, inspection, operation, maintenance and modification of OWTS facilities in the Lake District. The new ordinance was adopted in 2008, and since that time it has been the basis for a cooperative effort with the Galway Code Enforcement Official in dealing with the resolution of several OWTS issues. The Code Enforcement Official also cooperated with the Association by helping to inform campers about the provisions of the new ordinance through articles in the Galway Reader.

The Association monitors water quality at shoreline locations near suspected failing septic systems. Repeated bacteria readings above state guidance are reported to the camper, Director and, if necessary, to the Code Enforcement Official.

The Association has offered to conduct septic dye tests for campers that suspect their septic systems may not be operating properly. Thus far these tests have prompted the replacement of 2 septic systems.

Actions Planned or under Consideration: See Appendix A

Farm and Agriculture Activity

Streams, springs, ground water and storm water run off are the primary mechanisms for moving nutrients, bacteria and sediment from the lake's watershed into the lake. Galway Lake is fortunate to be fed by a watershed, or drainage basin, that is not currently populated by a lot of farms and commercial activities that yield large quantities of nutrients. However, a farm in the northern end of the lake, beaver activity in the West Bay Inlet Stream and shoreline septic systems have been nutrient issues associated with the watershed.

Problem

During the 2007 and 2008 seasons the lake experienced a significant aggressive weed growth and filamentous algae problem. The problem was primarily focused in the north and western shoreline of North Bay and West Bay Cove. Sampling in the inlet stream and storm water creeks indicated that a significant amount of nutrient laden water was flowing from a cattle farm pasture on Ridge Rd. where it was collected by a swale on Schoolhouse Rd. that fed a culvert under Hermance Rd. which directed the water into the lake.

Actions Taken

To help mitigate this problem, the association sought assistance from the New York State Department of Agriculture who worked with the farmer to institute more effective manure control procedures. In addition, the Association worked with the Town of Galway to have the Hermance Rd. culvert blocked and the storm water directed into a new swale, which now moves the storm water a greater distance before it enters the lake. Since these actions were taken, the aggressive weed growth and filamentous algae problems in North Bay have greatly improved.

The Association has also entered into a contract with the Darin Fresh Water Institute to test water entering the lake from the 2 primary tributaries and several storm water streams during January - March of 2011. The purpose of these tests is to evaluate the quality of spring thaw surface water entering the lake. At least 3

of these sites will be used to evaluate the effectiveness of measures to mitigate the impact of the farm nutrients and some of the other sites will be used to evaluate suspect OWTS issues.

Actions Planned or under Consideration: See Appendix A

Beaver and Development Activity in the Watershed

Problem

Beaver activity and development in the watershed, or drainage basin, can be a significant nutrient threat to the lake.

Headwater areas of the West Bay Inlet Stream and North Chuctanunda Creek are populated with several beaver dams. One branch of the West bay Inlet Stream has 5 dams that have created retention ponds of up to an acre or more. These dams perform a beneficial function in that they slow down the movement of sediment and help filter nutrients and bacteria, but they also present a threat. Beaver dams impound acres of nutrient laden water that can be released into the lake if a dam breaks or is removed. This problem was illustrated during the summer of 2004 when several days of rain overwhelmed 1 or more beaver dams on the West Bay Inlet Stream and a substantial amount of nutrient laden water was released into the lake causing an algae bloom which ran from West Bay Cove across the lake into East Bay.

Another watershed problem was averted when it became known that a large commercial activity was being planned for a 14 acre plot on Route 29 adjacent to the North Chuctanunda Creek. Based on information available concerning the nature of the commercial activity, the association determined that the OWTS requirements for the project would overwhelm the site and contaminate the stream. This information was provided to the Town Planning Board who included this information in their deliberations and did not approve the planned development.

A third watershed incident occurred when a commercial logging operation in the watershed of the West Bay Inlet Stream caused a significant amount of sediment to be carried by the stream into West Bay Cove. Calls for assistance to the Enforcement Division of the NY Dept. of Conservation resulted in prompt action to correct the problem, but only after a significant amount of sediment had been deposited in West Bay Cove.

Actions Taken

The vulnerability of the watershed, or drainage basin, has highlighted the need for the continued monitoring of activities, which could degrade the watershed and impact the lake's water quality.

Actions Planned or under Consideration: See Appendix A

Fertilizer

Problem

Commercial and natural fertilizers used on lawns and gardens along the lake shoreline or in the watershed contain high levels of nitrogen and phosphorus, which enter the lake via storm water and can be a prime source of lake nutrients.

Actions Taken

This nutrient source has been recognized as a problem for some time, but, the Association has no jurisdiction in this matter and has had to rely on property owner cooperation to inhibit the use of fertilizers. Appeals to Campers are routinely made in reports and letters.

Actions Planned or under consideration: See Appendix A

Waterfowl

Problem

Resident and migratory waterfowl, such as ducks and geese, can make a significant contribution to lake nutrients. Their fecal matter is a potent source of phosphorous and carries the parasites responsible for ear infections and swimmers itch. In 2008 the resident goose population began to expand causing a significant degree of concern on the part of association members. This concern was related to: potential health issues associated with the fouling of docks, rafts and shoreline property; added lake water nutrients and the possibility that these problems would continue to get worse based on a continued waterfowl population growth.

Actions Taken

During the 2009 season the Association entered into a contract with the Wildlife Services Division, US Department of Agriculture to capture a remove the 31 resident geese. This process was repeated again during the 2010 season and another 31 resident geese were removed.

Actions Planned or under consideration: See Appendix A

Internal Sources

Internal sources include:

- Fish and;
- decaying vegetative matter.

Problem

In-lake nutrient sources include fish fecal matter and decaying algae or vegetation. These materials are incorporated into existing lake bottom sediments and through leaching provide a potentially rich source of water borne nutrients for plants and algae that derive their food source from the water column. However, maintaining adequate levels of oxygen in the lower part of the water column can minimize the release these nutrients from the sediment.

Action Taken

During the 2004 season water tests confirmed that Galway was a stratified lake. This meant that during the summer season the lower level lake water would contain more nutrients than the upper level and that as the season progressed, oxygen levels in the lower part of the water column would diminish.
To confront this problem the Association instituted a Hypolimnetic Withdrawal Policy in 2005, which requires that excess lake water be drawn from the lower gate in the tower rather than spilled over the weir. This policy facilitates the removal of nutrient laden water from the lower level of the lake thereby reducing lake nutrients and improving the oxygen content of the lower water column.

Actions Planned or under Consideration: See Appendix A

Invasive Species

Problem

There are a variety of nonnative organisms, or invasive species, such as rooted aquatic plants, algae, invasive animals, viruses and insects that can threaten the ecological stability of a lake environment. Galway Lake has been fortunate, in that the only known invasive species confronting the lake environment at this time are 2 aquatic plants, Eurasian Water Milfoil and Water Chestnut. Other lakes in the area such as Lake George, Saratoga Lake and Sacandaga Lake have experienced a variety of invasive species problems involving plants, animals and insects.

The Association's challenge related to the invasive species problem has been to minimize the impact of the 2 invasive aquatic plants currently in the lake to and institute measures necessary to prevent the infestation of other invasive species.

Eurasian Water Milfoil (EWM)

EWM has been part of the Galway Lake plant inventory since at least the 1980's. In the late 80's EWM was aggressively growing in many parts of the lake and significantly impacting recreational activity.

One of the ways to kill, or at least control, EWM is to expose and freeze the plant's root system. During the winter of 1989-90 lake water was drawn to a level approximately 16 feet below the seasonal level. This draw down exposed and destroyed most of the EWM population.

EWM slowly recovered over the next few years and another draw down was conducted during the winter of 2005/6. During this draw down the water level was only dropped 10 feet and the temperatures were not adequate to properly freeze EWM root systems before the lake sediment was insulated with a snow pack. The EWM control resulting from this draw down was less successful than in 1990. There was a general thinning of the EWM plants, but they recovered quickly and a Lake Weed Survey conducted by the Darin Fresh Water Institute (DFWI) in 2009 found extensive EWM growth throughout most of the lake.

The DFWI also identified several methods for dealing with EWM and other aggressive weed growth in the lake. The Association evaluated each of these in terms of their costs, risks and demonstrated effectiveness in other documented applications. (See Appendix B) The Association decision was to conduct another draw down to a level of 12 feet below the seasonal level during the winter of 2010/11. The potential success of this draw down has been enhanced by an

extended period of sub freezing temperatures prior to any substantive snow pack.

Water Chestnut

Water Chestnut was first discovered in the lake during the 2009 weed survey. There were less than a dozen plants found in the northwest corner of North Bay. All plants found were removed and the site is being monitored for any future growth.

Other Invasive species

There are 3 other invasive species that pose an immediate and significant threat to the recreational quality of the lake. These are the Zebra Mussel, Spiny Water Flea and Asian Clam. These species currently reside in lakes that are in close proximity to Galway and can readily migrate to Galway on boats and fishing tackle. There is currently no effective way to deal with the mussels and clams other than physical removal which is an expensive and labor intensive process.

The association has instituted a monitoring program for zebra mussels and each boat brought into the lake at the association boat launch must is certified by the owner to have been thoroughly cleaned prior to launch. Also, to increase awareness of the invasive threat, the subject is routinely discussed in reports and camper meetings.

Actions Planned or under Consideration: See Appendix A

Aggressive Weed Growth

As previously discussed, aggressive weed growth is primarily the product of excessive nutrients and initiatives to mitigate the aggressive weed problem should be directed at nutrient reduction. However, since nutrient reduction measures may not respond to near term weed issues that impact recreation in selected areas of the lake, other short term measures may be required.

Problem

One of the areas requiring a short-term solution to the aggressive weed issue was West Bay Cove. Over the past several years the cove has become choked with EWM and other aggressive native weeds. This has created a significant recreational problem in the cove and has also facilitated and the spread of EWM to new growth areas in West and South Bays. The spread of EWM has been the result of EWM cuttings produced by the props of boats transiting the cove.

Action Taken

The action selected to deal with the weed issue in the cove was the installation of a geo-textile mat to act as a weed barrier and create a weed free channel for boats transiting the cove. The mat measured approximately 10 feet wide by 900 feet long and was held in place by rods lashed to the mat every 10 feet. The mat has had some problems, in that it traps gas from decaying matter and floats until it is punctured or weighted down. The Association has approved the use of these mats by campers to control weeds in their shoreline areas.

Another action that should enhance the control of weeds in the cove was the 2010 project to excavate 2 to 4 feet of sediment from a 28,000 square foot area in the cove to create a collection basin for sediment entering the lake from the West Bay Inlet Stream.

Actions Planned or under Consideration: See Appendix A

Algae

Algae are natural part of a lake's eco system and there are over 100 varieties in NY State lakes. Algae can appear as free floating green dots in the water column; a slime that attaches to hard surfaces like rocks and docks; a shimmering bloom on the surface of the water or a stringy filamentous mass on the sediment or surface of the lake. Algae also can appear in a variety of colors such as green, brown, red and white. The most troublesome forms of algae in Galway Lake have been: the blue-green and filamentous varieties.

Problem

Blue-Green Algae is a floating variety and thrives on phosphorus. Some blue-green algae create taste and odor problems and others can produce toxins that are dangerous to both humans and animals. Two illustrations of the impact of nutrients on algae growth include: the mile long algae bloom that was caused by a high concentration of nutrients that flowed into the lake from the West Bay inlet stream following the failure of a beaver dam and: and the late summer algae blooms which were routine prior to the implementation of the "Hypolimnetic withdrawal "policy, that reduces nutrients in the lower part of the water column.

Filamentous Algae also thrive on phosphorus and can become a significant threat to lake recreation as it did during the 2007 and 2008 seasons. (see actions taken under Farm and Agricultural Activity).

Actions Taken

Excessive nutrients, primarily phosphorus, are the root cause of aggressive algae and all efforts to reduce external and internal lake nutrients will help mitigate algae issues. However, during the past few years the Association has also undertaken steps to deal more directly with algae issues:

The Darin Fresh Water Institute has supported the Association with tests of algae suspected of being a threat to the health of humans and animals:
Instructions have been issued to campers related to the proper way to deal with specific algae issues.

The Association conducted a test of the use of barley straw bales to suppress the growth of filamentous algae. The findings of this test were not conclusive.

The Association has considered the use of Algaecides, but dismissed the idea due to the potential hazards and health risks associated with these products. (See Appendix C)
Actions Planned or under Consideration; See Appendix A

Sedimentation

Sedimentation is the process of decreasing the depth of the lake by the disposition of inorganic and organic materials on the lake bottom. External sources of sediment entering the lake are primarily turbid streams and muddy storm water runoff. Interior sources of sediments include decaying organic matter from in-lake plants and wave induced shoreline erosion.

Problem

Sedimentation is a natural process in the life cycle of a lake, which over time, will lead to the death of the lake. The management objective is to slow the sedimentation process to preserve the recreational quality of a lake for as long as possible.

Action Taken

The Association has identified sites along the lake's northern and western shoreline that are potentially significant sources of sediment. These sites are the 2 inlets, storm water streams and the storm water culverts installed and maintained by the town of Galway.

During November and December of 2010, an excavation project was conducted in the cove associated with the West Bay Inlet Stream. The purpose of this project was to remove 2-4 feet of sediment from a 28000 square foot area of the cove and create a basin to collect future sediment flowing out of the stream.

There are several areas of the lake where the unprotected shoreline is being eroded by wave action. The recent Association action to establish a policy limiting the horsepower of electric boats will preclude the additional erosion that could have been caused by the wave action of fast moving powerboats.

Actions Planned or under Consideration: See Appendix A

Bacteria

The safety of Galway Lake as a recreational resource depends on maintaining levels of bacteria within the standards established by the New York State Department of Health. The Association has a Bacteria Monitoring Program that involves annual bacteria tests at Grove Beaches and the selective testing of sites believed to be potential sources of bacteria or nutrients.

Problem

Over the past few years the monitoring program has identified bacteria issues, which have impacted the recreational use of lake water at several shoreline locations.

Action Taken

Bacteria issues at some lake beaches have been associated with ducks and other waterfowl. They have also been responsible for soiled rafts, docks and beaches. Directors have been advised to monitor this problem and take actions to discourage waterfowl activity in recreational areas.

Bacteria testing has also been used to assist in the identification of failed septic systems as discussed earlier.

Lake water bacteria and nutrients have common sources such as faulty OWTS facilities, waterfowl, animal and farm activity. Therefore actions directed at mitigating nutrient issues will also assist in the elimination of bacteria sources.

Actions Planned: See Appendix A

Appendix A – Actions Planned

This Appendix addresses the specific actions or tasks that will be undertaken to continue the process of identifying, monitoring or mitigating factors that impact the ecology or recreational use of Galway Lake. Actions and tasks are organized by issue and will vary in terms of priority, complexity and resource/time requirements.

NUTRIENTS

OWTS

- Coordinate with the new Town Code Enforcement Official on issues related to Zoning Ordinance provisions involving OWTS and the conversion or enlargement of buildings in the Lake District. Topics to be addressed include:
    - Detection and reporting of OWTS issues.
    - Conduct of OWTS inspections.
    - Standardization of OWTS inspection procedures.
    - OWTS considerations involving the conversion and/or enlargement of buildings.

- Determine if test data provided by the DWFI Storm Water Study provides evidence of new OWTS issues.

- Encourage the installation of “Cluster” OWTS facilities in areas where individual OWTS cannot operate in an efficient manner.

- Continue bacteria sampling at suspect sites and dye test services for campers.

- Arrange for reduced rate septic pumping in the Lake District and encourage campers to properly maintain their OWTS.

- Encourage Campers to report suspected OWTS problems.

- Develop procedures for reporting properties for sale in the Lake District.

- Develop an Association letter to remind Real Estate agents of Town Ordinance requirements for OWTS inspections in conjunction with the sale or transfer of properties in the Lake District.

- Increase association awareness of NYS approved new and innovative OWTS treatment solutions.

FARM AND AGRICULTURAL ACTIVITY

- Evaluate test data compiled by DWFI in the Spring Runoff Study to determine if there are significant residual nutrient issues associated with the Glen farm and whether nutrient other nutrient sources have been identified.

- Continue to conduct bacteria testing in the major inlets.

BEAVER AND DEVELOPMENT ACTIVITY IN THE WATER SHED

- Establish procedures for monitoring activity in the Galway Lake watershed, to include: beaver dams; farming or logging and plans for commercial or residential development. This task will include the development of maps, for the protected and unprotected areas of the watershed, and a protocol for interfacing with the Galway Planning Board.

FERTILIZER

- Reiterate in association correspondence the importance of not applying lawn fertilizer within the Lake District.

WATERFOWL

- Continue to use US Department of Agriculture services to control the size of the resident goose population.

- Identify measures to reduce the impact of migratory geese and the resident duck population in West Bay Cove and North Bay.

- Continue the Waterfowl Egg Addling Program

IN-LAKE NUTRIENT SOURCES

- Formalize the Hypolimnetic Withdrawal Policy to insure that it becomes a permanent part of the nutrient reduction program. The policy should identify the conditions under which water will be drawn from the lower gate and the information recorded about each event.

- Review the objectives and impact of the Association fish-stocking program before resuming the program in 2011.

INVASIVE SPECIES

EURASIAN WATER MILFOIL (EWM)

- Conduct a Weed Survey in 2011to determine the effectiveness of the 2010 drawdown on the EWM growth patterns documented during the 2009 weed survey conducted by the Darin Fresh Water Institute (DFWI). The near ideal weather conditions during the 2010 drawdown should have eradicated most milfoil growth inside the 10 foot depth and the ice scrub should have thinned EWM beyond the 10 foot depth. The results of this survey will assist in decisions related to the future roll of draw downs in the management of EWM and the need for supplemental EWM control measures.

- Determine the impact of the combined effects of the 20010 drawdown and sediment excavation on EWM and other weed growth in West Bay Cove.

WATERCHESTNUT

- Monitor the northwest corner of North Bay and other shoreline areas for water chestnut and other invasive weeds.

OTHER INVASIVE SPECIES

- Refine and expand activities involved in the identification, detection and mitigation of invasive species threats.

AGGRESSIVE WEED GROWTH

- Evaluate the impact of nutrient reduction efforts and the 2010 drawdown on Coon tail, and other native aquatic plants, based on findings from the 2011 Weed Survey and weed patterns established during the 2009 Weed Survey. The results of this evaluation should assist in the identification of new native weed growth patterns and their impact on recreational activity. The results of this evaluation could also lead to a discussion of the need for, and feasibility of, additional weed control measures (Appendix B).

- Determine the effectiveness of the remaining Weed Suppression Mat in West Bay Cove. During December 2010, the residual 360 foot mat was

repaired and improved. The mat was straightened, added weights were reattached and the fabric was punctured to allow gas to escape.

- Publish an Association policy related to the camper use of weed suppression mats and weed cutters.

ALGAE

- Advise Campers of potential health issues associated with blue- green algae.
- Continue the emphasis on all nutrient reduction and watershed protection initiatives.

SEDIMENTATION

- Determine ways to measure the sediment capture effectiveness of the new sediment basin constructed in the West Bay Cove.
- Investigate the desirability /feasibility of a sediment basin in North Bay Cove.
- Develop plans for constructing in-lake catch basins for the culverts and major storm water streams.
- Investigate the feasibility of actions to reduce shoreline erosion.
- Review the adequacy of Association policy related to altering shorelines and adding sand, or other material, to the shore and lake sediment.

BACTERIA

- Continue current bacteria monitoring policies.

Appendix B – Weed Control Alternatives

Weeds have plagued New York State lakes for decades and several management strategies have been devised to deal with this problem to include physical, mechanical, chemical and biological controls.

During the past several years much has been learned about these strategies, but no silver bullet has been found. All have some risks associated with their use and sometimes the selected strategy makes the problem worse.

The purpose of this Appendix is to discuss several of the more prominent weed management strategies highlighting their strengths and weaknesses.
The following are the weed control strategies discussed in this Appendix.

- Harvesting
- Rotovating and Hydroraking
- Dredging and Excavating
- Water Milfoil Weevil
- Grass Carp
- Aquatic Herbicides
- Draw Down

Appendix B - Harvesting

Harvesting involves cutting and removing the upper portion of rooted aquatic plants. There are 2 barge-mounted machines that are commonly used for this purpose. These are the single and multi stage harvesters.

The Single Stage Harvester cuts a 6 to 10 ft wide swath through aquatic vegetation at a depth of 6 to 8 ft deep and then moves the cuttings into the harvester via conveyer belt. When the harvester has a full load of cuttings it transports them to a shore location where they are loaded on a truck for disposal.

The Multi Stage Harvester has 2 barges. The first is a harvester that cuts a swath up to 12 ft wide by up to 10 ft deep. The cuttings are left to float to the surface of the water where they are they are raked up by a second machine and transported to shore and loaded on a truck for disposal. This 2 barge system allows the harvester to continue cutting while the second barge collects the cuttings and handles the disposal.

PRODUCTIVITY

For planning purposes 1 acre of weeds can be cut every 4 to 8 hours. The productivity of the mechanical harvesting process depends on several factors, such as the: type and size of the machine; depth of cut; type/density of weeds and the time required to unload waste.

COST

Cost factors for an In-House Operation

- Purchase and maintenance of equipment.* (harvester, barge, conveyors, trailers)
- Labor for equipment operation.
- Preparation and maintenance of sites for to launch/ storage of equip, load waste.
- Transportation and disposal of weed waste.
- Fuel and Insurance.
- Disposal site.

- The cost of a new harvester and shore conveyer is approximately $200,000.

Cost factors for a Contractor Operation

Contracting weed-cutting services would cost approximately $1,500.00 per day*. This does not include the removal, transportation or disposal of waste.

*Contractor cutting could improve productivity

ADVANTAGES

- Reduces nutrients if weeds are removed from the water.
- Cuts weeds to a level that supports recreation
- No permit required.

DISADVANTAGES

- Temporary solution with no long-term benefits.
- Cutting may have to be repeated during the season.
- Fragmentation spreads weeds to new growth areas.
    - Encourages expansion of Eurasian Water Milfoil (EWM) growth areas.
- Requires multiple shore locations to launch / store equipment and load waste on trucks.
- Requires a disposal site for all the weed waste.
- The harvesting, collection and disposal of weeds is a slow process.
- Harvesters and barges are large gas powered items of equipment.

Appendix B – Rotovating and Hydroraking

Both rotovating and hydro raking use barge mounted equipment to cut and remove lake weeds. The Rotovator uses a rototiller to cut aquatic plant roots from the sediment and remove them from the lake. The Hydroraker is more effective in removing strongly rooted plants and uses a mechanical rake to pull the weeds from the sediment and remove them from the lake. Both the Rotovator and Hydroraker are primarily used for vegetation control around docks and in swimming areas.

PRODUCTIVITY

- For planning purposes, approximately 1 acre can be tilled or raked per day. Productivity is impacted by the density and type of weeds as well as the time required to travel to/ from work sites and unload / dispose of waste.

COST

Cost factors for an In-House Operation

- Purchase and maintenance of equipment.* (barge mounted rake or tiller, waste barge, conveyor, trailers)
- Labor for equipment operation.
- Preparation and maintenance of sites to launch/ store equipment and load waste.
- Transportation and disposal of waste.
- Fuel and insurance.
- Disposal site.

- The cost of a new tiller or rake barge would be approximately $200,000.00

Cost factors for Contractor Operation

- Contracting the tilling or raking services would cost approximately $1,500.00 per day. This does not include the removal transport or disposal of waste.

ADVANTAGES

- Longer-term weed control, when compared to cutting.
- Can control EMF in shallow water for up to 2yrs.
- Reduces nutrients when weed waste is removed from lake.
- Effective in removing weed growth close to docks and shoreline areas.

DISADVANTAGES

- Removes both good and bad plants and can disrupt the lake ecology.
- Promotes the spread of EMF and other plants that grow from plant fragments.
- Promotes a growth of fast growing exotic plants vice native plants.
- Requires a permit.
- Requires multiple shoreline sites to launch equipment and load waste.
- Requires a disposal site for weed waste.
- Gas powered equipment

Appendix B – Dredging and Excavating

Both Dredging and Excavation involve the removal of the top layer of sediment that contains aquatic plants and nutrients that are in contact with the water column. This process can improve water quality by controlling sediment nutrients and provides at least a temporary control of rooted vegetation. Case Studies have shown mixed results in the use of dredging to control aquatic plants. In some cases it has reduced excessive vegetation levels in other cases it has been concluded that dredging is not likely to reduce the extent of plant coverage unless the water depth is increased to a depth that prevents sunlight penetration. Both dredging and excavation require a permit and the excavation; transportation and disposal of sediment material can be a very expensive proposition.

COST

Excavating 1 acre to about a 3 foot depth could cost in excess of $40,000.00.

ADVANTAGES

- Can improve water quality.
- Reduces impact of sediment and deepens lake
- Provides some degree of weed control.

DISADVANTAGES

- Cost.
- Not normally effective for weed control over the long term.
- Requires a permit.

Appendix B – Water Milfoil Weevil

The Water Milfoil Weevil has shown promise in controlling Eurasian Water Milfoil (EWM) without significantly impacting on the aquatic eco system. The weevil is an aquatic beetle that is native to North America and is about the size of a sesame seed. Weevils feed on milfoil, but they usually exist in such small numbers that they have little effect on milfoil growth. When their numbers are increased to proper levels they can begin reducing the recreational impact of milfoil after about 3 years. Weevils do not normally destroy milfoil plants, but, feed on the upper part of the plant and reduce its' height. The effectiveness of weevils as a strategy to control EWM depends on several factors to include: a proper habitat for over wintering; the impact of predators such as sunfish and blue gills; proper stocking; reproduction rates; the existence of hybrid or resistant varieties of milfoil and the use of other milfoil controls which may not be compatible with a weevil strategy, such as harvesting, herbicides and drawdown.

COST

Weevils cost between $1.00 and $1.20 per beetle. There are also significant contractor costs associated with the underwater survey requirements; beetle distribution and the annual management of a weevil strategy. A thousand or more beetles may be required for each acre of EWM and in 2009 Galway Lake had approximately 200 acres of EMF.

ADVANTAGES

- Minimal impact on a lakes' ecology.
- Can be a long-term control for EWM.
- No impact on the health of humans and animals.

DISADVANTAGES

- Lake level drawdowns threaten weevil survival.
- Requires a permit.
- Success of a weevil strategy is subject to many variables.
- Cost and risk of investment.
- Effectiveness of a Weevil Strategy is degraded by other strategies such as harvesting and herbicides.

Appendix B – Grass Carp

Grass Carp, or White Amur, can be effective in controlling weeds because they can eat 20 to 100 % of their body weight each day. They weigh 1 lb when stocked, grow up to 6 lbs/year and at maturity can weigh 25 lbs. or more.

The stocking of these fish requires an approved Environmental Impact Statement (EIS) and a permit, which limits stocking to sterile fish. Current New York State policy will not allow grass carp stocking permits to be issued to lakes which are within the boundaries of privately owned land and are an impoundment on a stream shown on a USGS topographical map.

Grass carp are stocked at rate of 10-15 fish per vegetated acre and will eat a wide variety of aquatic plants. Based on the inventory of plants in Galway Lake, there are 6-8 varieties of plants that the grass carp prefers before it is likely to be attracted to EWM or White Stem Pond weed which are the two problem plants in Galway Lake.

The number of Grass Carp required to control aquatic plants will produce a significant amount of excreted material which can drastically impact the ecology of a lake by stimulating plant growth, causing algal blooms and reducing oxygen levels in lake water.

COST

- Sterile grass carp cost approximately $15.00 each

ADVANTAGES

- May be a more acceptable strategy because it is perceived to be a “natural” control agent.

DISADVANTAGES

- Cost.
- Exclusion of lakes that are private and an impoundment on a stream listed on a USGS topographical map.
- Impact of excreted material.
- Not an effective strategy for EWM control.

Appendix B – Aquatic Herbicides

Aquatic Herbicides are chemicals that kill or inhibit the growth of Eurasian Water Milfoil (EWM) and other selected aquatic plants through a direct toxic reaction or by hampering their photosynthetic ability. Nearly all herbicides approved for use in NY State carry at least one water use restriction. These restrictions address factors such as time delay periods for various types of water usage following the application of the chemical.

Studies to date indicate that humans and most animals have a high tolerance to the short -term toxic effects of herbicides approved for use in New York State, however, the long term effects of herbicides on humans and other organisms have not been well studied!

Herbicides have been used in many New York State lakes and often with mixed results. The following is a brief overview of the use of herbicides in Saratoga Lake

- Saratoga Lake has had a long-standing weed control program addressing EWM and other weeds that impact the recreational use of the lake.
- Weed harvesters have been used to control EWM and other aggressive weed growth since the 1980's.
- During the period 2007 to 2009 a contractor treated the lakes three extensive EWM growth areas with herbicides.
- The last of the 3 separate treatment areas involved 292 acres. The treatment for this area required 66,920 lbs of the herbicide "Renovate" which cost $330,000.00.
- Weed surveys following the this treatment found:
    1. Only 3% of the sample points in the treated area contained EWM. Weed Surveys prior to the treatment found EWM at 80% of the sample points.
    2. Native plants replaced EWM in the treated areas and grew so robustly that a full time weed-harvesting program was required to create boating lanes from shore points.
    3. Spot or maintenance herbicide treatments are required to control new EWM growth areas and a full re-treatment may become necessary in a few years.

COST

- For planning purposes the cost of applying a herbicide, such as Renovate, will run $900.00 to $1000.00 per acre. There were approximately 200 acres of EWM in Galway Lake in 2009.

ADVANTAGES

- Herbicides are approved for use in New York State and have been successfully used to target and kill exotic and invasive plants such as Eurasian Water Milfoil (EWM) and Curly-Leafed Pondweed

DISADVANTAGES

- A permit is required to use herbicides in a NY State lake and only licensed applicators are allowed to dispense the permitted herbicide.
- Following treatment, a maintenance program or new treatment is usually required within 2 years to maintain control of the targeted plant(s).
- The effectiveness of a treatment is impacted by several factors to include: timing of the application; accuracy of the dosage and the weather.
- Impacted plants die in the lake and subsequently contribute to the nutrient enrichment lake bottom sediments.
- Areas cleared of targeted plants are usually quickly filled with other plants that can also impact recreational activity.

Appendix B – Drawdown

Drawdown involves the winter manipulation of the lake water level to expose rooted aquatic plants and sediment to the freezing and drying action of winter temperatures. Some species of aquatic plants can be killed or damaged by this process. Two of these aquatic plants are Eurasian Water Milfoil and Coontail, which are prominent in Galway Lake.

To be effective, the draw down must be gradual and started early enough to allow the exposed sediment to dry before it is exposed to freezing or snow cover. Reducing the water level too quickly will harm aquatic animals and negatively impact the lakes' ecology.

Also, the sediment must freeze to a minimum depth of 4 inches for maximum effectiveness, which is difficult unless the sediment is somewhat dry and free of an ice or snow cover.

Drawdowns are most effective when the entire littoral zone is exposed. The Littoral Zone is defined as the area of the lake bottom, which supports plant life. This usually is an area that extends from the shoreline to the maximum depth of light penetration.

COST

- There are few, if any, costs related to the draw down process.

ADVANTAGES

- Most cost effective way to control Eurasian Water Milfoil and has been successful in managing Eurasian Water Milfoil in Galway Lake.
- Assists in drawing sediment from the shoreline.
- Permits shoreline maintenance

DISADVANTAGES

- Risks associated with the weather supporting draw down objectives and lake refill.

Appendix C – Pictures of Selected Aquatic Weeds and Invasive Species